While forest and rangeland conditions continue to recover from historic land use legacies, new emerging forest health concerns have arisen.

Biological Diversity Status and Trends

Measurements of biological diversity are indications of environmental conditions. Simply defined, biological diversity is the variety of life over some spatial unit. It can be measured at several levels. These include ecosystem diversity (the variety of habitats and communities), species diversity (the number and mix of species within an ecosystem), and genetic diversity (variation within a species).

This assessment focuses on ecosystem and species diversity and, where data is available, on species population status and trends. Within any given landscape, the mix and relative diversity of species supported is frequently determined by the arrangement and types of habitat. Habitat conditions change over time and within a range of different plant communities (successional stages) that are determined by a number of factors, such as environmental conditions and historical and current land management activities. Some factors, such as permanent conversion of natural vegetation to development or agriculture have long lasting and obvious impacts on habitat and the mix of associated fish and wildlife. Other factors , such as competition between species, predation and disease, and the effect of environmental conditions during species migrations are more difficult to measure. Nevertheless, habitat based measures are frequently used—both with and without supportive wildlife population data—to make observations on the status of current and future biological diversity.

Biological Diversity Indicators

- Historical Loss of Forests and Rangelands
- Parcelization of Forests and Rangelands
- Area and Distribution of Habitat Types
- Conifer Forest Structural Characteristics—Size and Density
- Old Growth Forests
- Area and Distribution of Hardwoods
- Management Classification and Distribution of Habitats
- Population Status of Native Species
- Status of Endangered, Threatened, and Sensitive Flora and Fauna

Yosemite Valley, California.

Biological Diversity

Representative Goal

Protect forest lands and terrestrial and aquatic resources by focusing on protection of habitat, [including] connectivity, riparian habitats, oak woodlands, ecological old growth forests, and other key forest types…that are poorly represented [to avoid] threatened or endangered species designation *(California Fish and Game Commission policy on endangered and threatened species, California Fish and Game Code, Section 2050, California Public Resources Code, Section 12210, and California Forest Legacy Program Act of 2000).*

Findings

- California has lost 15 percent of its presettlement era native landscapes to urbanization and intensive agriculture. While expansive landscapes are still relatively intact, the extent of some habitats has declined significantly: riparian forests and woodlands (95 percent loss of historical statewide extent) and needlegrass steppes (99 percent loss).
- Low density, rural residential housing, called parcelization, affects 3.2 percent of forests and rangelands. Several bioregions have substantially higher levels (more than 10 percent), particularly in the South Coast, Central Coast, and Sacramento Valley bioregions.
- California has a wide range of forest conditions. Dense forest conditions where large trees contributed to a closed canopy, make up 24 percent of conifer forest land. Forests with smaller tree sizes (less than 24" in diameter) are the most extensive forest condition, covering 45 percent of conifer forests.
- Several unique habitats, such as old growth forests, have retained only a portion of their original extent. Old growth forests extent is currently aground one quarter of its historic level. Other valued forest structural elements such as snags and down logs and open canopies are also reduced in extent and distribution.
- Twenty-three percent of forests and rangelands are managed for ecological protection and other non-consumptive recreational and aesthetic values (Reserve status). The remaining 77 percent are managed for a wide range of ecological and commodity uses (Working status). Some Lands in Working/Private status, with limited extent and future risks of additional land use impacts, are of particular concern.
- Regulatory listings of species as threatened or endangered continue to rise, particularly for plant and fish species.
- Population numbers of many species are stable; however, some large mammal, bird, and amphibian species once considered common are declining in population.

Historical Loss of Forests and Rangelands

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter3_Quality/habitat.html
Data Quality: Partial data ◐

One of the regional indicators used to measure the status of biological diversity relates to the change in extent (area) of forests and rangelands over time (Figure 18). The analysis estimates the percentage of presettlement native landscapes (forests and rangelands) lost to urbanization or agriculture uses since settlement in California began in the 1500s–1600s. This date reflects the general time frame of initial exploration and the onset of European settlement in California (Kinney, 1996). The analysis does not consider lands with low density, rural residential housing. It considers only intensive agriculture and urbanization (housing density of one or more units per acre or commercial/industrial use).

Losses have been most evident in the San Joaquin Valley, Sacramento Valley, South Coast, and Bay Area/Delta bioregions (Figure 18). These changes exemplify California's transition from a state known for utilizing its abundant natural resources to one of a mostly urban population living among these resources.

Parcelization of Forests and Rangelands

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter3_Quality/habitat.html
Data Quality: All necessary data ●

Parcelization is defined as low density rural residential development—housing density of one or more units per 20 acres but not exceeding one housing unit per acre. While the conversion of land to urban uses has relatively obvious and straightforward impacts due to the nearly complete loss of natural vegetation, the more extensive parcelization at the fringes of urban areas retains at least some ecologically important characteristics.

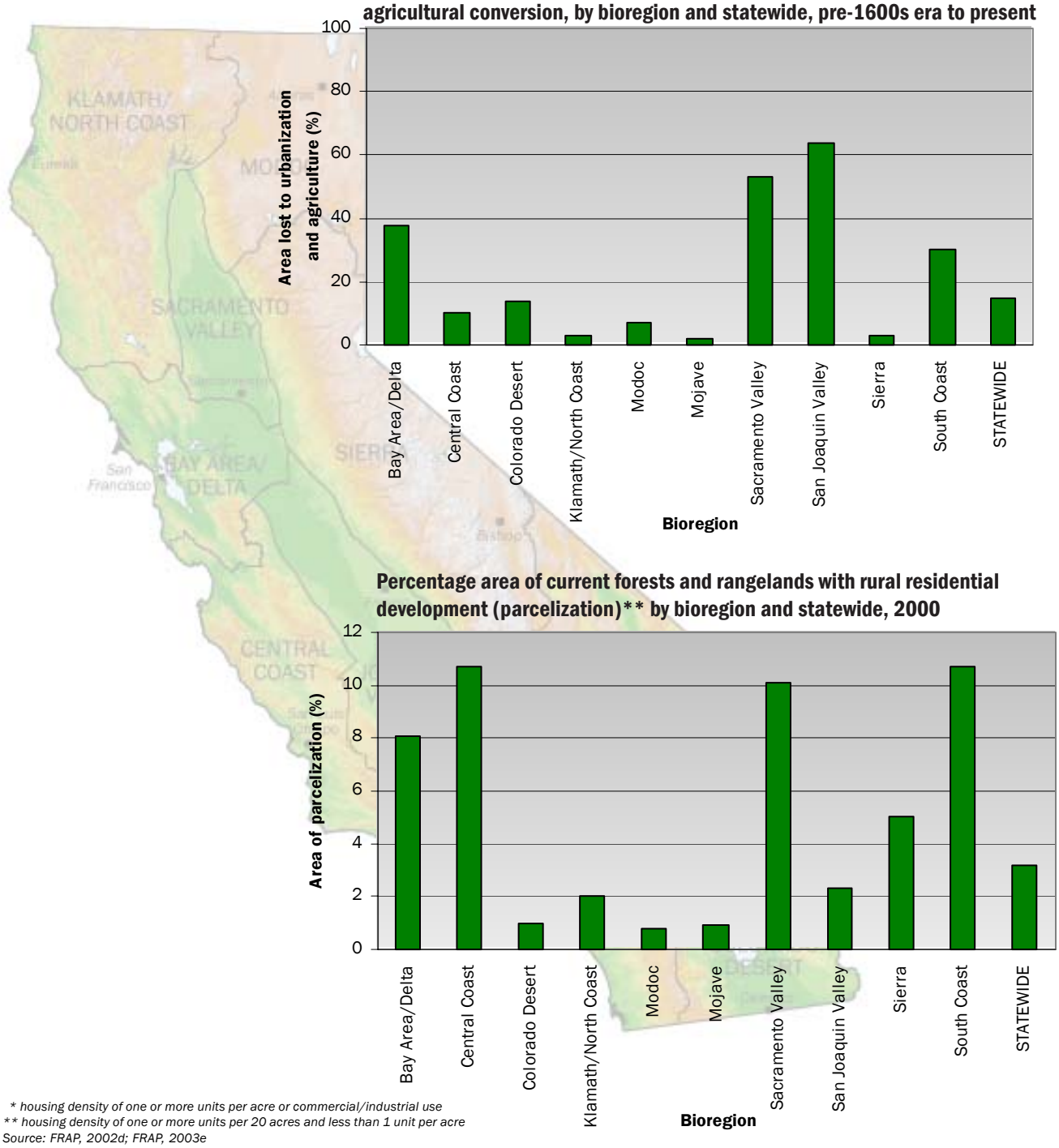
Parcelization is also an indicator of probable future urbanization. FRAP has conducted studies of historical housing growth in California that show parcelized areas are highly likely to densify toward urban levels. By understanding where and how such parcelization occurs, land use planners, stakeholders, and other decision makers can prioritize measures to protect biological diversity and other values.

Overall, less than five percent of forests and rangelands are parcelized. The highest current levels of parcelization occur in the South Coast, Central Coast, and Sacramento Valley bioregions, affecting more than 10 percent of the forest and rangeland extents. The Bay Area/Delta bioregion is also highly parcelized (approximately eight percent). Least parcelized are the Modoc, Mojave, Colorado Desert, and Klamath/North Coast bioregions (all with less than two percent of area parcelized). The San Joaquin Valley bioregion has significant parcelization within agricultural lands, but not within the remaining forests and rangelands.

Photo courtesy of Bureau of Land Management.

Figure 18. Regional Biological Diversity Indicators

Large scale land conversion and development during California's recent history has negatively influenced biological diversity on a regional basis. As new land uses alter the extent and arrangement of the forest and rangeland landscape, biological diversity will be further challenged.



** housing density of one or more units per acre or commercial/industrial use*
*** housing density of one or more units per 20 acres and less than 1 unit per acre*
Source: FRAP, 2002d; FRAP, 2003e
Map: California Biodiversity Council bioregions.

Additional analysis of recent historical progression of housing development further describes regional declines in land cover. Using the Weislander vegetation data from the 1940s (Pacific Forest Trust, 1998), FRAP analyzed the progression of development (housing density of one or more housing units per 20 acres) from 1940 to 2000. During this period, 3.1 million acres (10 percent) of forests and rangelands became developed (Figure 19). Rangeland development has been substantial over this time frame with over two million acres developed (Table 6). Bioregional differences show that the South Coast has experienced the largest total and percentage change in forest and rangeland land cover due to housing development (Table 7).

The current status and projected trend of the extent of forests and rangelands has implications for the conservation of biological diversity (see Chapter 3, Forest Health - Development). Some areas have experienced relatively little change. For example, while their vegetation characteristics are markedly different, bioregions such as the Modoc, Klamath/North Coast, and Central Coast, maintain a high percentage area of their original plant and wildlife communities. Conversely, within the South Coast and lower elevations of the Sierra and Central Coast bioregions, there is increasing development pressure that will be a challenge for the conservation of biological diversity over the coming decades.

Table 6. Area and percentage area of private, undeveloped lands that became developed* between 1940 and 2000, by land cover type (thousand acres)

Land cover type	1940 undeveloped land base area	Area developed 1940–2000	Percentage area developed 1940–2000
Forest	7,550	724	10
Range	24,346	2,358	10
Agriculture	11,860	2,740	23
Barren*	7,297	563	8
Total	51,052	6,384	13

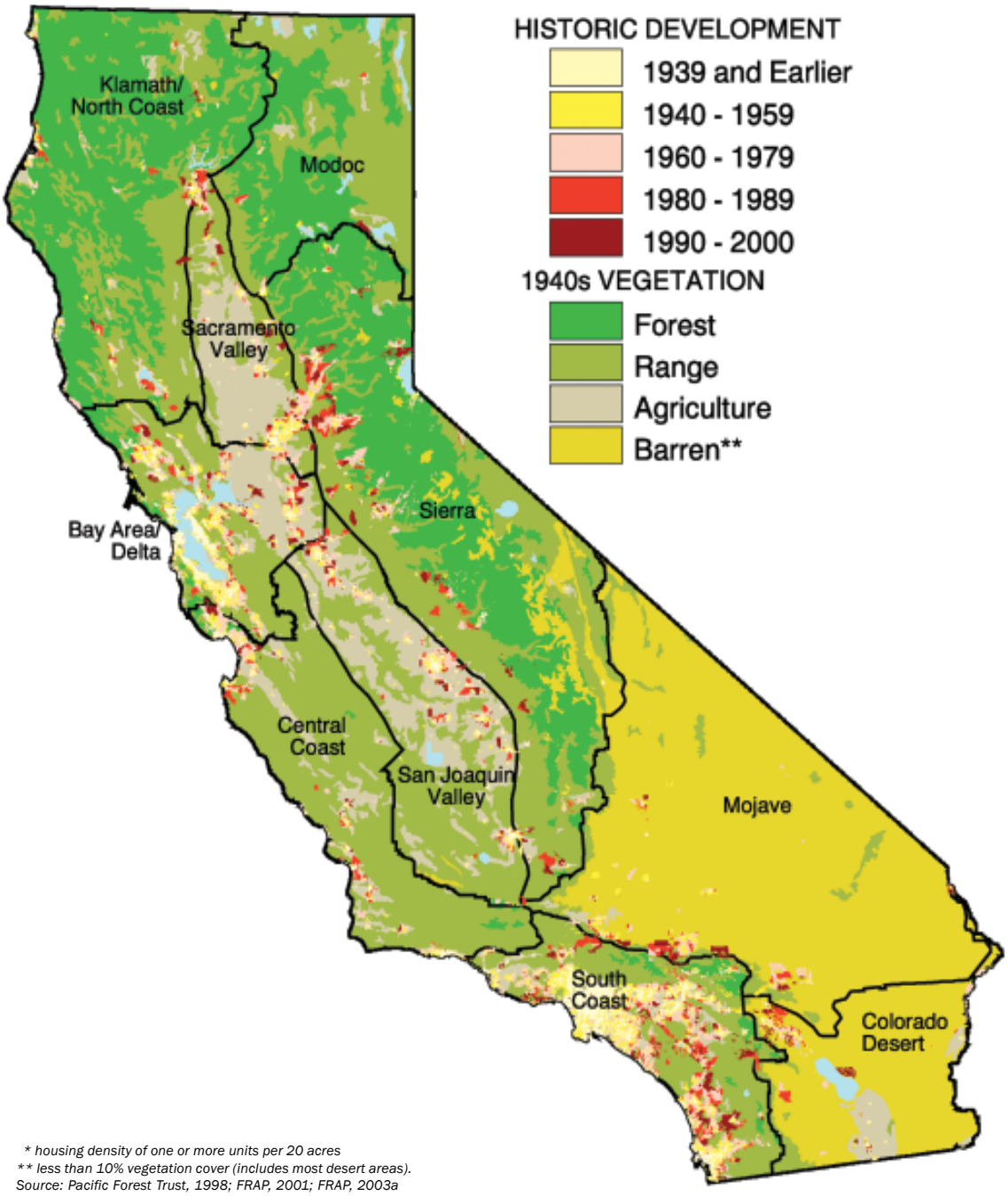
** housing density of one or more units per 20 acres*
Source: Pacific Forest Trust, 1998; FRAP, 2001; FRAP, 2003a

Table 7. Area and percentage area of private, undeveloped forests and rangelands that became developed* between 1940 and 2000, by bioregion (thousand acres)

Bioregion	1940 undeveloped area of F & R	Area of F & R developed 1940–2000	Percentage area developed 1940–2000
Bay Area/Delta	2,458	287	12
Central Coast	4,701	238	5
Colorado Desert	160	9	6
Klamath/North Coast	7,116	248	3
Modoc	3,005	56	2
Mojave	538	86	16
Sacramento Valley	1,488	196	13
San Joaquin Valley	3,774	44	1
Sierra	5,928	932	16
South Coast	2,678	985	37
Total	31,845	3,081	10

** housing density of one or more units per 20 acres*
F & R - forests and rangelands
Source: Pacific Forest Trust, 1998; FRAP, 2001; FRAP, 2003a

Figure 19. Historical progression of development*



** housing density of one or more units per 20 acres*
*** less than 10% vegetation cover (includes most desert areas).*
Source: Pacific Forest Trust, 1998; FRAP, 2001; FRAP, 2003a

Area and Distribution of Habitat Types

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter1_Biodiversity/habitatdiversity.html
Data Quality: All required data

FRAP uses the California Wildlife Habitat Relationship System (CWHR) to classify natural vegetation into habitat types for its Multi-Source Land Cover dataset (v02_1). The CWHR system provides a means to classify vegetation by wildlife habitat condition and species use.

Forests and rangelands include a wide variety of habitats. Conifer, Hardwood, Shrub, Grassland, Desert, and Wetland land covers contain 42 different CWHR habitats and cover over 80 million acres (Table 8, Figure 20). Forests are defined as lands with greater than 10 percent tree cover and include the Conifer Forest, Conifer Woodland, Hardwood Forest and Hardwood Woodland land cover classes. Typical Conifer Forest habitats include Sierran and Klamath Mixed Conifer, while Juniper is a common habitat in Conifer Woodland. Typical Hardwood Forest and Hardwood Woodland habitats include Montane Hardwood and Blue Oak Woodland, respectively.

Rangelands include Conifer Woodland, Hardwood Woodland, Shrub, Grassland, Desert, and some Wetland land cover classes. Typical habitats include Coast Oak Woodland, Mixed Chaparral, Annual Grassland, Desert Scrub, and Wet Meadow (see Appendix for a complete table of habitat types and a detailed map of distributions).

Some of the CWHR types are relatively rare such as Valley Oak Woodland (137,000 acres), Aspen (40,000 acres), and Joshua Tree (84,000 acres). Furthermore, specific species within broader CWHR habitat types such as Monterey Pine (*Pinus radiata*), Giant Sequoia (*Sequoiadendron giganteum*) and Engelmann Oak (*Quercus engelmannii*) also have low abundance. From a public policy perspective, any substantial reduction in these habitats from conversion, natural catastrophes, or habitat simplification would be potentially significant given their limited current extent.

Table 8. Area of forests and rangelands by land cover class (thousand acres)

Land cover class	Area
Conifer Forest	19,004
Conifer Woodland	2,363
Hardwood Woodland	5,188
Hardwood Forest	4,690
Shrub	14,565
Grassland	10,919
Desert Shrub	23,461
Desert Woodland	87
Wetland*	268
Total	80,545

** Only the Wet Meadow CWHR habitat type is considered forests and rangelands. See Appendix.*
Source: FRAP, 2002d

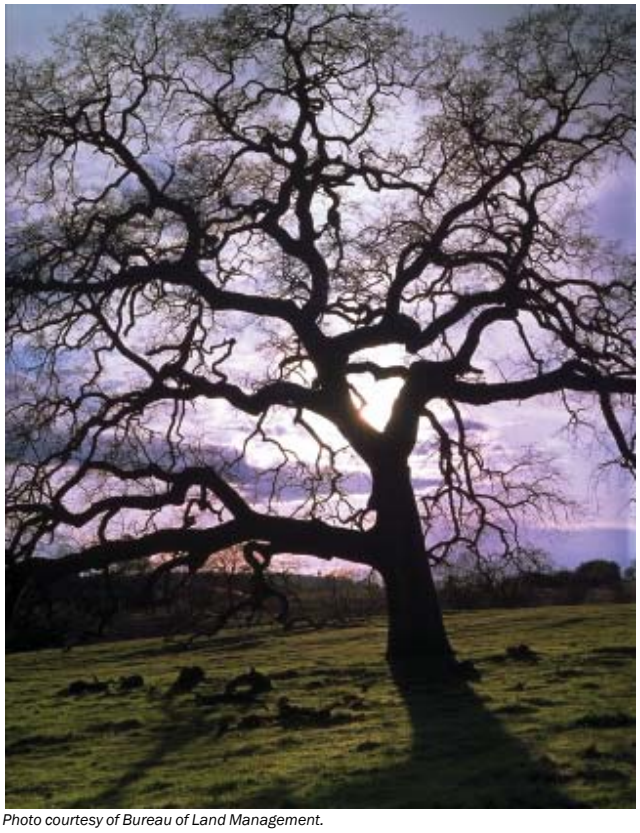
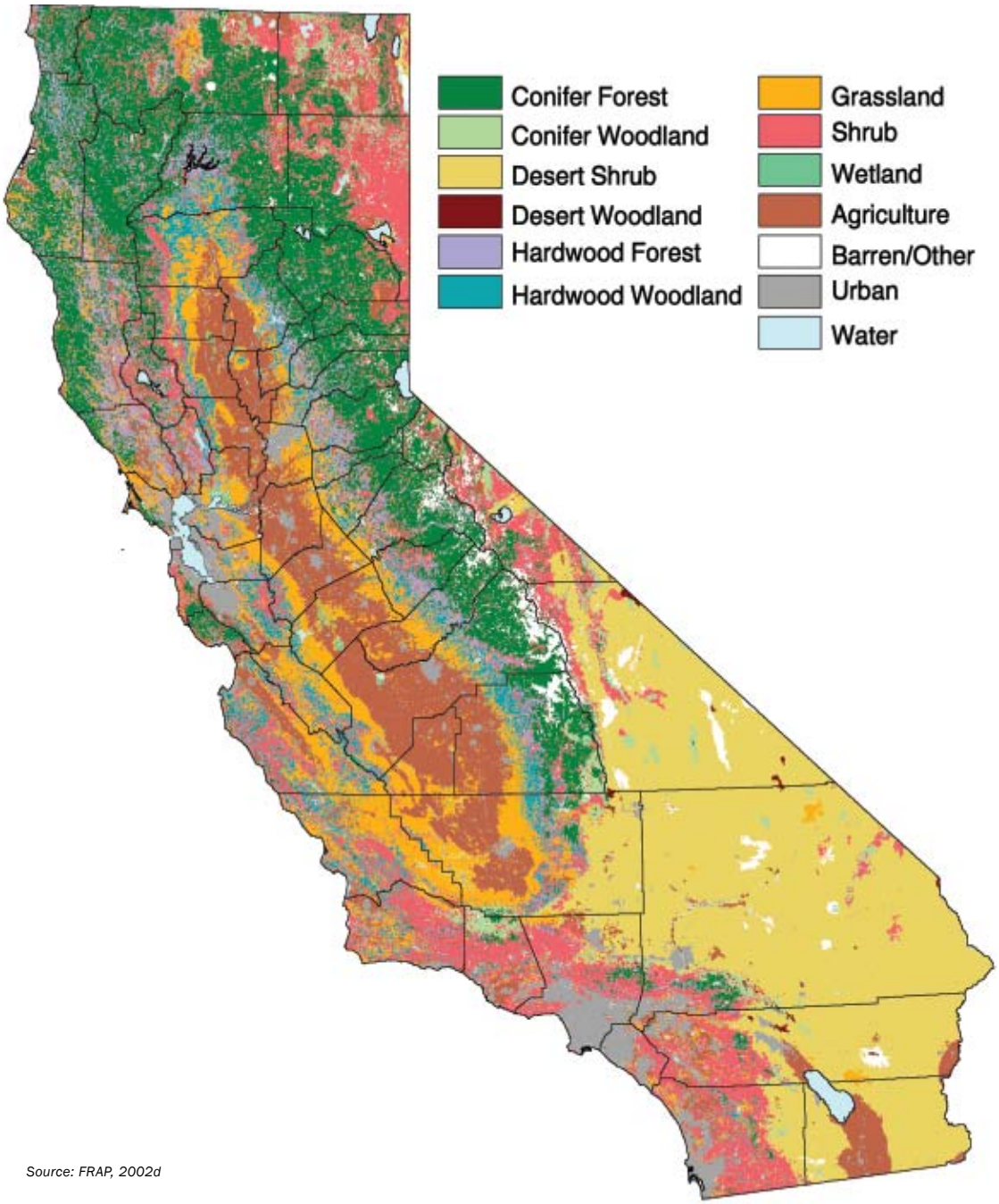


Photo courtesy of Bureau of Land Management.

Figure 20. Land cover of California



Source: FRAP, 2002d

Conifer Forest Structural Characteristics—Size and Density

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter1_Biodiversity/habitatdiversity.html
Data Quality: All required data

Data on the size, density, and age of forests in California help provide an understanding of current and future habitat conditions related to fish and wildlife. Ecosystem processes and associated biological diversity are related in part to different characteristics of vegetation structure (age, diameter, height, density) and successional stages (progression of plant community development). Other structural elements, such as individual snags and down logs, cannot be mapped at the scale used here but play important roles in defining habitat quality for animal species.

Forest management and natural agents have changed the structural characteristics of California forests over time. These characteristics are dynamic and at any point in time, what was true a decade earlier may have changed due to growth, removals, fire, competition, and/or decline of vegetation. The picture from today's perspective is that conifer forests are dominated by trees over 10 inches in diameter at breast height (DBH) in size and in dense or moderately dense stands (Table 9). About two-thirds of all conifer forests fit this description in terms of tree size and canopy closure measurements.

One impact of this pattern is concern over the lack of open forest stands (10 to 39 percent canopy closure) and associated plant communities in some areas. Fire exclusion policies and timber management practices have reduced the extent of open forest canopy conditions that foster grass or shrub development in the forest understory. Where closed canopy conditions are widespread, they have contributed to the decline in species associated with these open canopy habitats. Most forests currently in the open canopy class will grow into moderate canopy closure and not thin out without harvesting programs or extensive wildfire.

Another concern is the maintenance of sufficient area of forest habitat containing large trees in addition to

Table 9. Percentage area of Conifer Forest by tree size and canopy closure

Canopy closure	Seedlings and Saplings <10" dbh	Small trees 11" to 24" dbh	Medium to large trees >24" dbh	Unclassified	Total
Open (10-39% CC)	6	11	2	1	20
Moderate (40-59% CC)	4	14	4	1	23
Dense (>60% CC)	7	21	24	1	53
Unclassified	<1	<1	<1	4	5
Total	17	45	31	7	100

CC – canopy closure; dbh – diameter at breast height (4.5 ft); <1 – less than one percent; Note: totals may not add due to rounding
Source: FRAP 2002d

Conifer forest stand. Photo courtesy of G. Donald Bain, Geo–Images Project, UC Berkeley.

those classified as "old growth." Of the 19 million acres of Conifer Forest, 31 percent are dominated by medium to large trees (over 24 inches) (Table 9). An additional 45 percent are in the 11 to 24–inch range, and could be recruited into the larger class over the next few decades.

Old Growth Forests

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter1_Biodiversity/oldgrowth.html

Data Quality: Partial data ◐

Old growth forests represent the other end of the spectrum of forest development. Old growth has attracted much public attention and over a million acres of these forests have been designated parks and reserves. These forests provide a variety of ecological and social values that are hard to quantify. Consequently, defining and measuring the extent and quality of this resource can be problematic. For example, the significance of a single large tree will have a markedly different value when seen from ecological, cultural, or inspirational perspectives.

The USFS defines old growth by identifying the structural characteristics that indicate the onset of an old growth forest seral stage (Beardsley et al., 1999). In addition to stand size greater than 20 acres, the principal structural characteristics, which vary by forest type and site class, include the following measures:

- stand age;
- size and density of large trees;
- size and density of large snags and logs;
- degree of multiple canopy layers; and
- degree of decay in live trees.

The California State Board of Forestry and Fire Protection uses a broader definition to identify late successional forest (LSF). This definition, contained in the Forest Practice Rules (FPRs), uses tree size, canopy cover, functional characteristics (snags and down logs), and a minimum patch size of 20 acres. In general, late successional forest stands have considerable structural and ecological overlap with old growth forest stands and may, in time, provide a number of the values attributed to old growth forests.

Approximately 2.7 million acres (14 percent) of Conifer Forests are classified as old growth based on statistical assessments of field plots on public and private lands (Table 10). The vast majority (over 96 percent) is in public ownership where protection is required by law or is a probable management objective (Table 11). A substantially larger amount of Conifer Forests (6.2 million acres) are classified as LSF based on canopy cover and tree size characteristics, but ignoring smaller components such as snags, down logs, and other habitat elements. Many of these acres, particularly those on public lands, will be managed to achieve older forest structure over time. The extent and location of these stands in the future will depend on management objectives, catastrophic events (e.g., wildfire, insects, disease), and growth potential.

Table 10. Area of late successional* and old growth forests by type (thousand acres)

General forest type	Total Conifer Forest cover	Late successional*	Old growth stands
Mixed conifer	7,848	2,240	553
Douglas-fir	3,335	1,662	414
True firs	2,240	878	602
Redwood	1,297	608	95
Pine	3,642	715	929
Sub-alpine	642	97	137
Total	19,004 (100%)	6,200 (33%)	2,730 (14%)

** approximate estimate of late successional forests excludes consideration of 20 acre minimum patch size and presence of functional characteristics (decadent trees, snags, and large down logs)*
Source: compiled by FRAP from Warbington and Beardsley, 2001; Bolsinger and Waddell, 1993; Franklin and Fites-Kaufmann, 1996; FRAP, 2002d

Table 11. Percentage of total old growth area by ownership

Owner	(%) of old growth area
National Forest Wilderness and Reserves	29
National Forest	49
Other Public Reserves	17
Other Public	1
Private, Industrial	1
Private, Non-Industrial	2
Total	100

Source: compiled by FRAP from Warbington and Beardsley, 2001; Bolsinger and Waddell, 1993; Franklin and Fites-Kaufmann, 1996; FRAP, 2002d

Area and Distribution of Hardwoods

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter1_Biodiversity/hardwoods.html

Data Quality: All required data

Hardwood forests and woodlands are some of the most biologically rich vegetation types in terms of the number of vertebrate species supported. FRAP estimates over 9.8 million acres of Hardwood Woodland and Hardwood Forest exist statewide (Table 12, Figure 21). Hardwood Woodland comprises approximately 53 percent of these acres. Within Hardwood Woodlands, Blue Oak Woodland habitat has the most extensive distribution covering 29 percent of all Hardwood extent. Of the Hardwood Forest types, Montane Hardwood habitat has the most extensive distribution covering about 45 percent of total Hardwood area.

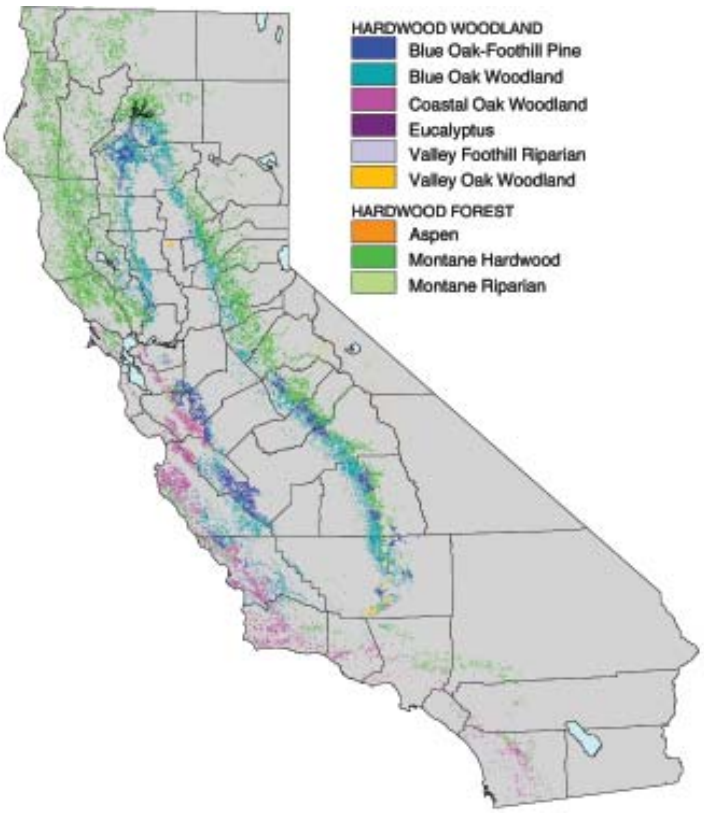
Management Classification and Distribution of Habitats

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter1_Biodiversity/FindingsHabitatOwnrshpMgmt.pdf

Data Quality: Partial data

California's species and habitats are protected by a variety of laws, regulations, and land use designations. Examples include national and state parks, wilderness areas, and public and private ecological reserves. In addition, numerous habitats on private ownerships, such as Blue Oak Woodland, remain relatively large and intact even though they have been actively managed for more than a century. Each land cover or habitat type can be classified using FRAP's Management Landscape groupings.

Figure 21. Extent of Hardwood Woodland and Hardwood Forest CWHR types



Source: FRAP, 2002d

Table 12. Area of CWHR types and percentage of total hardwood area (thousand acres)

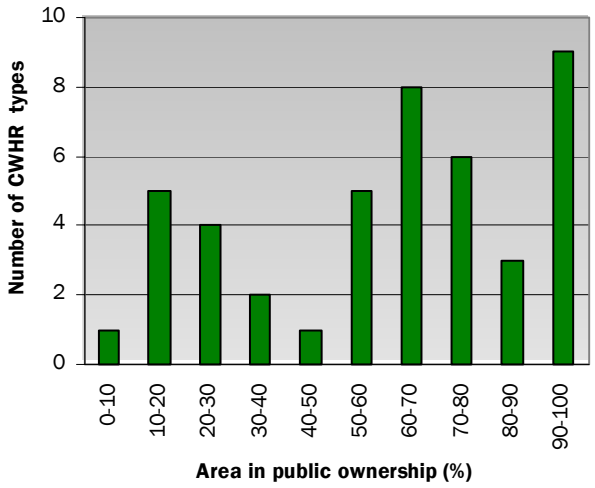
Habitat type (CWHR)	Area	Percentage of total hardwood area
Hardwood woodland		
Blue Oak Foothill Pine	979	10
Blue Oak Woodland	2,819	29
Coastal Oak Woodland	1,095	11
Eucalyptus	11	<1
Valley Foothill Riparian	147	1
Valley Oak Woodland	137	1
Total	*5,188*	*53*
Hardwood forest		<1
Aspen	40	<1
Montane Hardwood	4,439	45
Montane Riparian	211	2
Total	*4,691*	*47*
Total hardwoods	9,879	100

Source: FRAP, 2002d

The distribution of the nine major forest and rangeland land cover types by management class provides insight to the land use objectives afforded to each type. A similar analysis can be applied to individual habitats (Table 13). For example, Hardwood Woodlands are predominately found in the Working/Private class while Desert Shrubs are predominately in the Public or Reserve classes.

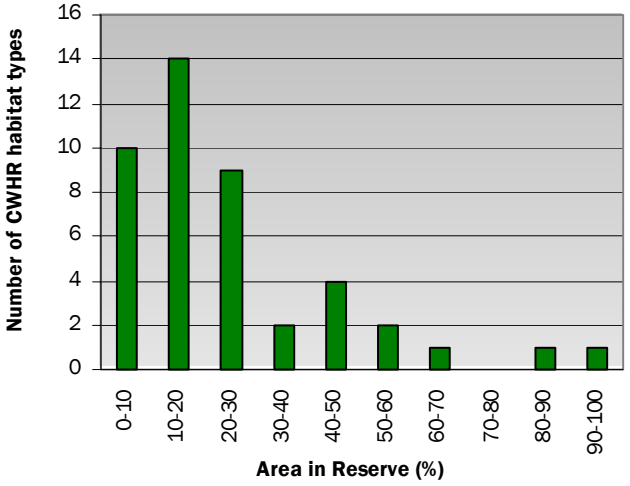
For public lands, 26 habitats of the 44 forest and rangeland habitat types have extensive (greater than 60 percent) area in public ownership (Figure 22). Lands in Public ownership are rarely converted to more intensive land uses and management shifts to Reserve status do not involve loss of private property rights. In contrast to public ownership, many habitats are not well represented in the Reserve class (Figure 23), with 33 having less than 30 percent of their area in Reserve. While Reserve status may provide a high level of protection from intensive land uses, other threats such as wildfire ignore administrative boundaries. Increasing the area of underrepresented habitats in Reserve status is one strategy to protect land from intensive use. However, this typically requires Congressional approval or acquisition of new land. For the majority of habitat types, biological diversity has depended upon—and will continue to depend upon—sustainable management within the Working/Public, Working/Private, as well as Reserve management classes.

Figure 22. Number of CWHR types by percentage area in public ownership



Source: FRAP, 1999; FRAP, 2002d

Figure 23. Number of CWHR types by percentage area in Reserve Management Landscape class



Source: FRAP, 2002b; FRAP, 2002d

Table 13. Area of land cover classes by selected Management Landscape classes* (thousand acres)

Land cover class	Reserve	Working/ Private**	Working/ Public**	Rural Residential***	Total
Conifer Forest	3,827	5,901	8,810	437	18,975
Conifer Woodland	757	414	1,166	20	2,356
Hardwood Woodland	344	3,783	624	263	5,013
Hardwood Forest	505	2,560	1,312	256	4,633
Shrub	2,750	4,685	6,477	477	14,389
Grassland	504	7,860	872	431	9,667
Desert Shrub	9,070	3,604	10,472	228	23,374
Desert Woodland	53	23	9	2	87
Wetland	65	125	60	4	253
Total	17,875	28,953	29,802	2,117	78,747

** Due to mapping differences between Management Landscapes (v1.0) and the Multi-Source Land Cover (v02_1) for the Urban and Agriculture classes, total forest and rangeland area numbers do not agree.*
*** Sparsely Populated*
**** includes Working/Public/Rural Residential and Working/Private/Rural Residential*
Source: FRAP, 2002b; FRAP, 2002d

Population Status of Native Species

On-line Technical Report:
http://frap.cdf.ca.gov/assessment2003/Chapter1_Biodiversity/population.html

Data Quality: Partial data

Biological diversity may also be assessed by examining population trends of a species or species group or by examining trends in formal listings under state and federal endangered species laws. California's forests and rangelands support many species (Table 14). Conifer Forests provide optimal, or at least suitable, breeding habitat for 354 wildlife species including 114 mammals, 177 birds, and 63 reptile and amphibian species. The California Department of Fish and Game and other agencies monitoring animal populations have identified three key findings on population trends regarding big game, bird, and amphibian species.

Population numbers and trends of large mammals are varied. On a local herd assessment unit basis, marked declines and increases in deer species numbers, habitat quality, and availability are evident. In recent years, deer (*Odocoileus hemionus*) populations have shown the most marked declines in northeastern California and the northern and central Sierra Nevada. Bighorn sheep (*Ovis canadensis spp.*) numbers have decreased from the effects of habitat loss, disease, and predation. Information on trends in furbearer and non–game mammal populations is limited in California. Currently, only the bobcat (*Lynx rufus*) shows potentially downward trends in population over the last 10 years.

Bird species within cavity nesting, open cup nesting, and neotropical life history groups (groups of species with similar life history requirements) are frequently the object of conservation and management initiatives. Managers are concerned over the loss of snags, nest parasitism by other bird species, and habitat loss. Smaller percentages of bird species were considered stable in the period of 1980–99 than from 1966–1979. Some bird species previously considered common in forested habitats, but also requiring open shrub and herbaceous conditions within their habitat type, have shown marked long term population declines (Table 15). These trends may be indicative of the general reduction in open forest canopy conditions and, in particular, the herbaceous and shrub understory components.

Over the last decade, many amphibian species in California have shown general population declines. Frog and toad species have exhibited the most significant declines. Forty percent of the toad species (four of 10) and 88 percent of the native frog taxa (seven of eight) have been lost from at least 45 percent of their historic California distribution. Extensive rangelandwide surveys are continuing across most habitat and owenership classes.

Table 14. Species richness by land cover class*

Land cover class	Number of species				
	Amphibians	Reptiles	Birds	Mammals	Total
Agriculture	9	12	194	61	276
Conifer Forest	32	31	177	114	354
Conifer Woodland	6	51	141	85	287
Desert Shrub	11	53	102	85	251
Desert Woodland	13	50	156	67	286
Hardwood Forest	30	26	175	102	333
Hardwood Woodland	30	45	205	98	378
Grassland	20	38	135	114	307
Shrub	27	68	186	133	414
Urban	4	8	169	43	224
Wetland	29	22	186	89	326

** Optimal (High) or Suitable (Medium) breeding habitat suitability ratings*
Source: California Department of Fish and Game and California Interagency Wildlife Task Group, 2001

Table 15. Number of bird species with stable or decreasing population trends by life history groups

Bird species	1966-1979		1980-1999	
	Stable	Decreasing	Stable	Decreasing
Neotropical migrants	79	---	73	---
Open cup nesters	83	14	73	24
Cavity nesters	85	5	65	27

Source: Sauer et al., 2000

Status of Endangered, Threatened, and Sensitive Flora and Fauna

On-line Technical Report: http://frap.cdf.ca.gov/assessment2003/Chapter1_Biodiversity/speciesofconcern.html

Data Quality: Partial data

California has a rapidly growing population and is also the most biologically diverse state in the contiguous United States. As a result, threats to the continued existence of native species and existence of their habitats on which they depend are also increasing. The California Department of Fish and Game ranks species degradation and loss of habitat from urbanization as the greatest threat to the continued existence of the state's listed flora and fauna.

Examining biological diversity from a regulatory perspective reveals the total number of federal or state listed species in California has increased from 195 in 1987 to 389 in 2000 (Table 16). Plant species show the largest increase in number of formal listings.

Table 16. Cumulative number of officially listed* taxa, 1987–2000**

Year	Plants	Gastropods	Crustaceans	Insects	Fish	Amphibians	Reptiles	Birds	Mammals	Total
1987	118	-	-	-	18	8	9	20	22	195
1990	215	1	2	12	18	8	9	26	25	316
1993	218	1	2	13	18	8	13	28	26	327
2000	254	2	8	20	26	10	13	28	28	389

** Officially listed animal species refers to state listed as threatened or endangered (T&E), federally listed as threatened or endangered or on both the state and federal list as threatened or endangered. Officially listed plant species refers to those that are state listed as threatened, endangered, or rare (TE&R), federally listed as threatened or endangered, or both state and federally listed as threatened or endangered.*
*** includes species, subspecies, distinct populations, and evolutionary significant units (ESU)*
Source: California Department of Fish and Game, 2001a

*California Red-legged frog (*Rana aurora draytonii*). Photo courtesy of U.S. Fish and Wildlife Service.*